

ALTERNATIVE MODES OF DELIVERING SUPPLEMENTARY
READING SERVICES TO COMPENSATORY EDUCATION STUDENTS
IN RELATION TO READING ACHIEVEMENT AND COST
EFFECTIVENESS

BY

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TO MY MOTHER

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The facets of the problem investigated in the study were to determine if there were differences in reading achievement of Title I students, in a single school, who were provided services by two different modes of delivery; to determine if the variables of sex, race, ability, and socioeconomic status had a significant effect on the reading achievement of students; and to determine if there were differences in the cost effectiveness indices for each of the delivery modes.

The study was conducted in a small rural school district with the sample drawn from a single school in the district. The sample population included all of the Title I identified students in the school during the 1979 fiscal year. The students were randomly assigned to a Capital Intensive delivery mode group and a Labor Intensive delivery

mode group. The Capital Intensive delivery mode consisted of a set of planned, individualized, and programmed procedures in which people and machine were used in an integrated manner to achieve results. The Labor Intensive delivery mode consisted of procedures for delivering services where the greatest monetary expenditure for input was for human effort. The criterion for program effectiveness was residual score for reading achievement as measured by the California Achievement Test. Cost data collected for the study included expenditures for salaries, materials and supplies, staff development, and indirect cost.

The primary data analysis techniques utilized were multivariate regression analysis and t test for difference between means. The multivariate regression analysis was used to test the effect of the delivery mode, race, sex, socioeconomic status, and ability on the dependent variables of Vocabulary subtest, Comprehension subtest, and Total Reading scores on the California Achievement Test. The t test was used to test the significance of the difference in mean cost effectiveness indices for each of the delivery modes.

The main effects for delivery mode were not significant at the .05 alpha level across the criterion variables. The main effects for ability and pretest score were significant at the .05 alpha level across the criterion variables. The main effects for sex and race were significant at the .05 alpha level when using the Comprehension score as the criterion variable. A significant F ratio for the interaction of effects for race and delivery mode indicated that there was at least one difference between the sets of means studied for the Vocabulary subtest. The analysis for Comprehension subtest indicated a significant interaction effect for sex and delivery mode. Again, the significant F ratio

indicated at least one difference between the sets of means studied. The t statistic reported in the analysis for the difference in the cost effectiveness means was not significant at the .05 alpha level.

The following conclusions are based on the results of the data analysis and must be considered within the limitations of the study.

1. The two delivery modes used in the study did not significantly effect students' reading achievement.

2. The reading achievement of compensatory students was effected more by the personal and social variables used in the study than by the mode of delivering reading services.

3. Students' ability level and initial achievement level were the most consistent predictors of success in the elementary compensatory reading program.

4. There was no significant difference in the cost effectiveness indices for the Capital Intensive delivery mode and the Labor Intensive delivery mode for reading services.

CHAPTER I INTRODUCTION

Equal opportunity is basic to the tenets of democracy. National concern for the equalizing of opportunities for all citizens of the United States erupted in an unprecedented social action program in 1964: the War on Poverty. The core of the educational facet of the program was the teaching of reading and language competencies.

The Congress of the United States, in an attempt to equalize educational opportunity and to foster basic skills proficiency for all citizens, entered the arena of massive allocations of resources to education with the passage of Public Law 89-10: the Elementary and Secondary Education Act (ESEA) of 1965. The law encompassed a multitude of areas including aid to educationally disadvantaged students. Title I of ESEA entitled "Title I - Financial Assistance to Meet Special Education Needs of Children" (Congressional Record - House, 1978, p. H12139) was the embryo that grew into the largest federally funded program for education, as of 1979, that the United States had ever experienced. The 1978 amendments to ESEA extended the elementary/secondary and adult education programs through 1983, funded at the \$50,000,000,000 level. In 1979 the funding for Title I alone exceeded the \$3,000,000,000 level (Harris, 1978).

The federal government, with the passage of ESFA in 1965, accepted and perpetuated the theory that increasing "inputs" would

increase "outputs"; by increasing resources for education, basic skills proficiency could be increased and the "American dream of equality of opportunity could be made a reality" (Becker, 1977, p. 518).

McLaughlin (1975), citing the 1967 testimony by Daniel Moynihan before the House Subcommittee on Education in reference to Title I evaluations by the TEMPO Division of General Electric, noted:

We had thought we knew all that really needed to be known about education in terms of public support, or at the very least that we knew enough to legislate and appropriate with a high degree of confidence. We knew what we wanted to do in education and we were enormously confident that what we wanted to do could work. That confidence has eroded. We have learned that things are far more complicated than we thought. The rather simple input-output relations which naively no doubt, but honestly, we had assumed to obtain in education simply, on examination, did not hold up. They are not there. (p. 49)

Subsequent evaluations of Title I contributed little knowledge that might temper Moynihan's contentions. Publications by Gamel, Tallmadge, Wood and Blinkley (1975), Glass (1970), and the U. S. Office of Education (1969, 1976) reported that the Title I efforts were not effective in increasing proficiencies in basic skills even though Title I had, in some respects, equalized opportunity by improving financial and educational resources. The Title I programs, in general, had failed "to show consistent, replicable improvements in basic and cognitive skills" (Becker, 1977, p. 519).

In 1979, the preponderance of literature led the researcher to the conclusion that there was no consistent reason given as to why Title I field-based experiments had failed. Senator Robert Kennedy (cited in McLaughlin, 1975, p. 33) proposed in 1967 that failure of Title I programs was due to the disinterest if not malfeasance of

local school administrators. Program analyst Alice Rivlin, when interviewed by McLaughlin (1975, p. 33) in 1972, attributed failure to the technical inexperience of local evaluators, and Becker and Englemann (1976) suggested that "instruments used to measure outcomes reveal changes caused by maturation rather than school instruction" (p. 519).

Much of the literature through 1979, additionally, focused on variables other than school experiences that contributed to the output measures of student achievement. The factors of socio-economic status, race, sex, and ability level were among those that research had validated as having a relationship to student achievement (Boocock, 1966; Coleman, Campbell, Hobson, McPortland, Mood, Weinfeld, York, 1966; Cronbach, 1970; Entwistle, 1972; Khan, 1976; Mayeske & Beaton, 1975; McDill, 1967; Simons & Bibb, 1974; Summers & Wolfe, 1975).

The public schools are committed to serving all children. Title I educational planners and decision makers have been perpetually faced with the task of choosing between alternative programs or alternative delivery modes to best meet the needs of students. Decisions are sometimes made without the needed data base; sometimes there is just a lack of knowledge to know what to do to teach children or, more precisely, how to teach the educationally disadvantaged child. ESEA Title I services to students from 1965 through 1975 were predominantly of a labor intensive delivery mode. The greatest monetary expenditure for input was for human effort. With the advent and acceleration of technological development there was an increased interest and application of technology in the field of education beginning in the early 1970's. Capital intensive modes for delivering ESEA Title I services

were implemented in some educational systems. The delivery mode consisted of a set of planned, individualized, and programmed procedures in which people and machine capabilities were utilized in an integrated manner to achieve educational results.

The expenditures for public services, particularly education, had increased so much that taxpayers, during the 1970's decade, became resistant to additional increases. The taxpayer began to ask what he was getting for expenditures and, further, expected significant return for dollars spent for educational services. In response to taxpayers concerns, procedures were developed for analyzing the relationship between dollar input and student output (Cohn, 1975). Some states and districts adopted cost effectiveness procedures in an attempt to identify ways to control costs without diminishing program effectiveness. The studies that were available on these efforts indicated that the procedure was feasible in education (Forbes, 1975).

Thomas (1971) related the input/output relation or cost effectiveness to educational decision making. He postulated that the effective administrator

is able to define a problem, collect relevant data, and bring this data to bear on the problem. He identifies possible alternatives and selects the most promising. This means that formal decision making procedures must . . . replace the more intuitive procedures which have prevailed in the past. It would be appropriate . . . to measure the cost of each instructional system, and to measure the effectiveness of each. (p. 79)

Reported research through 1979 devoted some attention to the cost effectiveness of programs implemented for ESEA Title I students. The preponderance of research had been limited to effectiveness with no consideration given to cost. Thus, the concern in the study presented is to address a relevant local administrative decision problem:

to determine the cost effectiveness of alternative modes for delivery of programs to educationally deprived students looking at program effectiveness, program cost, and the relative cost effectiveness.

The Problem

Problem Statement and Hypotheses

The problem investigated in the study was threefold: to determine if there were differences in reading achievement of Title I students, in a single school, who were provided services by two different modes of delivery; to determine if the variables of sex, race, ability, and socioeconomic level had a significant effect on the reading achievement of students for each of the delivery modes; to determine the relative cost effectiveness of each of the two delivery modes.

More specifically, the following hypotheses were tested and the .05 level of significance was accepted as the criterion of rejection:

1. There are no significant differences in reading achievement between students receiving Title I services in a capital intensive delivery mode and students receiving Title I services in a labor intensive delivery mode when holding constant the variates of sex, race, socioeconomic status, and ability.

2. There are no significant differences in reading achievement between the two levels of sex, for each of the delivery modes, holding constant the variables of race, socioeconomic status, and ability.

3. There are no significant differences in reading achievement between the two levels of race, for each of the delivery modes, holding constant the variables of sex, socioeconomic status and ability.

4. There are no significant differences in reading achievement between the two levels of socioeconomic status, for each of the

delivery modes, holding constant the variables of sex, race, and ability.

5. There are no significant differences in reading achievement between the levels of ability, for each of the delivery modes, holding constant the variables of sex, race, and socioeconomic status.

6. There is no significant interaction between and among alternative delivery modes, sex, race, socioeconomic status, and ability as they relate to reading achievement.

7. There is no significant difference in cost effectiveness indices between the capital intensive and labor intensive delivery modes when using reading achievement as the measure of effectiveness.

Delimitations and Limitations of the Study

The study herein focused on alternative delivery modes for reading instruction to compensatory students in a single rural school. The individual school was arbitrarily selected by the researcher based on the willingness of the school administrator to participate in the study and a school structure that would best fit the design of the study. The sample for the study consisted of all ESEA Title I identified students in the selected school who were assigned to grades one through five for the 1979 fiscal year. Personal social student variables were limited to race, sex, socioeconomic status, and ability. The measure of socioeconomic status was limited to information provided on free and reduced lunch application forms. Ability level measures were limited to scores on the Slosson Intelligence Test.

The measure of delivery mode effectiveness was limited to residual gains in reading achievement as measured by the California Achievement Test. The cost measure was limited to actual dollar expenditure for

the provision of compensatory instruction services to ESEA Title I students at the school site. Only variable costs which could be controlled by the decision makers in the school district were included. The cost variables included were those related to personnel, supplies, materials and equipment.

Conclusions from the study on which delivery mode was the most cost effective cannot, necessarily, be generalized to other school settings or age groups due to differences in similarly entitled programs and the unique characteristics of Sumter County students.

Justification

Planning is the key to successful educational programs. The importance of planning can be attested to by the throng of programs on the market that hopefully lead to successful management. There are few administrators/managers who have not used or at least become acquainted with such planning approaches or techniques as Program Evaluation and Review Technique (PERT), Program Planning and Budgeting System (PPBS), or Systems Analysis.

Educational planning is futuristic decision making. Technological, political, and social forecasting of future needs in areas that are related to education will provide the knowledge base from which alternative educational programs are proposed. Decision making then becomes the process of selecting from the proposed alternatives.

Since 1965, vast quantities of resources have been appropriated and disseminated to educational systems to provide services for the educationally and economically disadvantaged student. Administrators/managers are constantly faced with making decisions in respect to utilizing these resources in the delivery of services. Intelligent

choices are made when there is a broad knowledge base available to be utilized in making the decisions. Frequently, the knowledge base available is limited to measures of output when, in reality, it should also include the inputs along with an analysis of the input/output relation. The complexity of educational operations, the scarcity of resources available for educational programs, and the growing public demand for evidence of what results can be expected from increased fiscal inputs calls for new planning, analyzing and evaluating.

Limited financial resources to meet existing and growing demand is neither new nor unique to education. Frequently, however, local decision makers do not have adequate information on the potential educational impact of program changes before they are made. Although a degree of uncertainty always exists when changes are made, improvement in the information base can significantly reduce the uncertainty and improve the decision making process (Dudick, 1972).

By the early 1970's most businesses of any size had computerized their revenue and expenditure accounts for reporting purposes. They also developed systems to analyze as well as report. Of particular interest in these analysis systems was the relationship between the cost of a productive factor and its contribution to total return: its productivity. These data were then used to identify the more productive inputs and/or the most profitable products.

Information on the relationship between the cost of an input and its contribution to the final product is not available in most school districts when crucial budget decisions must be made. To generate the information requires several steps. The proposed study is an attempt

to develop a relatively simple analysis technique with the data available in one school district.

Selecting the value measure of the success is more difficult in education than in business. Profit is not the only outcome valued by most successful businesses. Likewise, achievement is not viewed as the only valued outcome of an educational program. It is, however, generally agreed that improved academic achievement is one essential outcome of any successful instructional program. The federal program included in the study herein presented includes improved achievement in reading as one of the stated objectives, and reading was listed as the highest priority objective of the local school district in the 1978-79 district comprehensive plan.

Few decisions in public education can be made on input/output data alone; however, the information does add a vital dimension in the decision making process (Forbes, 1974). If the cost effectiveness model utilized in the study presented produces useful information, it could be expanded to allow for the quantification of other input and output measures. More complex models could then be developed to demonstrate what is being produced in local ESEA Title I schools, the quantity and types of resources being utilized in that production, and the cost involved. The improved information base could certainly contribute to improved decision making both by educators and taxpayers in the district.

Assumptions

The study herein presented incorporates the basic assumptions listed below:

1. The California Achievement Test is a valid instrument for measuring reading achievement for Title I students in grades 1 through 5.

2. The Slosson Intelligence Test is a valid instrument for measuring the ability level of Title I students in grades 1 through 5.
3. Participation or nonparticipation in the free and reduced lunch program is a valid measure of socioeconomic level for Title I students in grades 1 through 5.
4. The improvement of the reading achievement level of students within a program is one valid criterion of the program's success.
5. Personnel, materials, supplies, and equipment costs are appropriate measures of program costs.
6. The identification of cost effective instructional delivery modes and the consideration of that information in district decision making is both economically and educationally sound.
7. Expenditures for operation and maintenance of plant, capital outlay, food service, transportation, and administration were equal for each delivery mode group.

Definition of Terms

Cost effectiveness. Cost effectiveness is the relative ratio of the cost of providing services and the effectiveness of the service for different delivery modes.

Delivery modes. Delivery modes are the organizational strategies for delivering reading services to Title I students: labor intensive and capital intensive.

Economically disadvantaged. The economically disadvantaged student is that student who received free or reduced lunch during the 1979 fiscal year.

Educationally disadvantaged. The educationally disadvantaged student is that student that falls on or below the 50th percentile on the

California Test of Basic Skills administered in April 1978.

LEA reading teacher. The LEA reading teacher is a teacher who is a member of the regular district instructional staff and provides the basic reading instruction to Title I students.

Posttest score. The posttest score is the standardized score obtained on the California Achievement Test administered in spring of 1979.

Pretest score. The pretest score is the standardized score obtained on the California Achievement Test administered in the fall of 1978.

Reading achievement. Reading achievement is the residual gain score for students from pretest to posttest as measured by the total reading scores on the California Achievement Test.

Supplementary reading instruction. Supplementary reading instruction is the reading instruction provided by the Title I program over and above that which is provided as a part of the regular school program.

Title I aide. The Title I aide is a paraprofessional assigned on a full time basis to assist the Title I teacher in the performance of the teacher's assigned duties.

Title I school. Title I schools are those schools in the district having a high percentage of economically disadvantaged students and, in addition, receiving federal Title I monies to implement supplementary instructional services for educationally disadvantaged students.

Title I students. Title I students are those students who scored at or below the 30th percentile on the California Test of Basic Skills and who are enrolled in the Title I program at the school.

Title I teacher. The Title I teacher is a teacher who is assigned on a full time basis to the provision of supplementary reading instruction to Title I identified students.

CHAPTER II REVIEW OF THE LITERATURE

The literature reviewed relevant to the problem investigated is divided into three categories: literature related to the provision and evaluation of supplementary instructional services to educationally disadvantaged students, the personal and social variables that affect cognitive educational outcomes, and cost-effectiveness analysis of educational programs. The review is limited to published and selected unpublished literature from 1965 through 1979.

Provision and Evaluation of Services to Educationally Disadvantaged Students

The Elementary and Secondary Education Act (ESEA) of 1965 was enacted with the hopes of significantly benefiting the educationally disadvantaged student. In many respects, the enactment was a legislative first.

The legislation embodied the first federal aid to parochial schools, the first federal aid measure to address deficits attending disadvantaged children, not fiscal or material deficits in local school systems. ESEA was the first large aid-to-education bill to be passed in the absence of a national crisis [such as the launching of Sputnik] and ESEA Title I was the first major piece of social legislation to require evaluation. (McLaughlin, 1975, p. 12)

Title I of the act provided more than \$1,000,000,000 a year for services. The Education Amendments of 1974 (P. L. 93-380) targeted \$2,000,000,000 for Title I, and the Educational Amendments of 1978

extended the fiscal resources for Title I to more than \$3,000,000,000 (Harris, 1978; Hill, 1976).

Educational accountability, according to McLaughlin (1975), emerged with the evaluation requirements proposed and subsequently included in the act. The requirement to evaluate was unsettling to many educators. In addition, state educational personnel and fewer local school administrators had any experience with evaluation of federal programs in 1965 (pp. 8-9). Bailey and Mosher (1968) observed that

no piece of social legislation in American history has placed a greater premium upon the reporting and evaluating of results than ESEA. The legislative mandate for formal reports and evaluation of programs was loud and clear, and unprecedented in scope. (pp. 162-163)

Two reports on the effects of schools led to intense governmental scrutiny of the evaluation schemes being used across the United States for Title I. The 1966 Equal Education Opportunity Survey (EEOS), also known as the Coleman report, found that schools had little impact on overcoming the unequal educational attainment that accompanied low socioeconomic status (Coleman et al., 1966). The U. S. Commission on Civil Rights (1967) reported that attempts to remedy achievement differences between poor children and more affluent ones had been ineffective. As a result of the two reports, early in 1967 the Bureau of Research commissioned the TEMPO Division of the General Electric Company to undertake a cost-benefit analysis of compensatory education subsequently known as the TEMPO study. "The study was conceived as a pilot study designed to relate academic achievement to compensatory education program components and costs" (McLaughlin, 1975, p. 34). The analysis plan outlined three general questions: What impact did Title I have on pupil achievement? What school, pupil, and background

variables were associated with academic achievement? What distinguished successful Title I strategies? Whaley (1970) in summarizing the TEMPO findings postulated that Title I programs had, in general, failed to make an impact on student achievement scores. McLaughlin (1975) said:

The TEMPO study revealed serious deficiencies in the information system and in the knowledge base presumed to support decisionmaking throughout the Title I policy system--from the local school district to the OMB. TEMPO indicated that even within a universe of reputedly exemplary programs, no one knew what worked, or who was receiving what. The study pointed to a dearth of knowledge about local implementation of a federal initiative, specifically. Even though the Title I formula specified a population, and program applications outlined a program, and despite the successes portrayed by local project evaluations, neither the population nor the program, or outcome, could be identified by the TEMPO staff. Over one billion federal dollars seemed to be disappearing into the nation's educational system with scarcely a trace. (p. 51)

The concerns raised in the TEMPO study led to the 1968 survey of compensatory education. The TEMPO study had provided no significant data for the federal government concerning Title I. A report issued by the U. S. Department of Health, Education and Welfare (1971) said:

we knew little about the kinds of projects . . . and almost nothing about the results . . . in improving the performance of educationally deprived children. (pp. vii-3)

The results of the 1968 national survey of compensatory education were, once again, less than conclusive as to the positive effects of the programs. McLaughlin (1975) stated that "Title I was not found to help . . . compensatory programs were not closing the gap; in fact, participation in compensatory programs seemed to be having no effect at all" (p. 59). The 1969 survey of compensatory education was launched before the "ink was dry" on the 1968 survey: before the survey data had been analyzed and interpreted. The new survey had as one of its major

objectives to promote sound management decision makers at the state and federal levels by providing good data on which decisions could be based. The lack of attention given to the 1968 survey before launching the 1969 survey were shibboleths offered to appease the fiscal and programmatic authorities (McLaughlin, 1975, p. 60). Glass (1970, p. 193) reported that the new survey had no more success than the 1968 effort in achieving usable achievement data. It was no wonder that the Glass report was

buried somewhere in USOE. Thus, the report "that was to provide definitive information on the efficiency of implementation of Title I ESEA and the effectiveness of that program" has never seen the light of administrative day, nor has it [officially] informed a single decision maker. (McLaughlin, 1975, p. 61)

In the ensuing years Congress continued to mandate evaluations of compensatory education programs in the anticipation of collecting data for decision makers as to the effectiveness and costs of successful programs. Fiscal year 1979 was distinguished as being the mandated year for implementation of a new (at that time) national evaluation model that would make results of Title I programs comparable across programs, districts, and states. The new model was also designed to eliminate many of the problems that plagued previously used designs (Tallmadge, Note 1).

Personal and Social Variables

There were frequent conflicting reports in the literature from 1965 through 1979 as to the impact of personal and social variables on student educational achievement (Armor, 1972; Boocock, 1966; Coleman et al., 1966; Mayeske, 1973; Pollard, 1973). The preponderance of the studies used student scores on standardized achievement tests as the measure of outcome. "Consequently the available research

is primarily directed toward discovering variables associated with cognitive achievement" (Collazo, Lewis, & Thomas, Note 2).

Researchers utilized a variety of variables when investigating the effect of personal and social variables on achievement. The findings reported different results as to the impact of the variables on student achievement. Johnson (1975) in reviewing the National Assessment of Educational Progress said that the assessment indicated that there were differences in achievement between students residing in different areas. Mayeske & Beaton (1975) reported that area or region of residence accounted for only 5% of the total student variations in educational achievement. Some studies reported that racial differences significantly related to achievement scores (Boocock, 1966; Coleman et al., 1966; Pollard, 1973). Armor (1972) and Mayeske (1973) postulated that racial difference itself was not a controlling variable, but that achievement was a result of the totality of the family background. A student's self-concept was often related in the literature to success in school. Purkey's research (1970) showed "a persistent and significant relationship between the self-concept and academic achievement" (p. 15). Pollard (1973) found only one self-concept variable that significantly correlated with achievement: the concept of ability. The correlation between intelligence and educational achievement was reported from very high to very low. Cronbach (1970) reported low correlation between intelligence and educational achievement. In respect to the findings he said:

When the material is rote in nature, and no meaning can be supplied by the learner (as in many laboratory tasks) good general ability gives little or no advantage. There is some reason to think that rote memory is a separate ability. Good performance on a truly rote task may occur as often among those we call "dull" as among the bright. (pp. 293-294)

Conversely, Entwistle (1972) and McDill (1967) found that the single best predictor of educational achievement was mental ability.

The studies reported in the literature were fairly consistent in finding that sex difference affected achievement. Simons and Bibb (1974) found that sex difference was closely related to underachievement. The findings showed that there were more male underachievers than female. Correlations between predictors and achievement were shown to be higher for females than similar correlations for males (Khan, 1976). Summers and Wolfe (1975) concluded that achievement is higher for females than males in elementary school. In junior high school, it was only the males of low ability that scored lower than females on achievement tests. In senior high school, those males of low or average ability scored higher than females with equivalent ability. In the extensive analysis by Mayeske and Beaton (1975) it was found that sex was not a significant source of difference among students.

Coleman et al. (1966) reporting on the Equality of Educational Opportunity survey reported that student achievement was related to the educational backgrounds and goals of their peers in the school. As the social environment of the student changed, a student would achieve more nearly like the peer group. Mayeske (1973) and McDill (1967) both confirmed Coleman's contention when they analyzed his data. On the other hand, some researchers reported that there was no evidence that peer characteristics had a strong independent influence on achievement (Averch, 1972; Smith, 1972).

Economic and Social Benefits

In the United States there has long been a strong belief in the economic and social benefits of education. Robert D. Leiter (1975),

professor of economics at the City University of New York, stated:

At least from the time of our founding fathers, this country has stressed its faith in education as a means of bringing about social change. Thomas Jefferson, Horace Mann, and John Dewey are illustrious names in this tradition. (p. 9)

Leiter further postulated that the impact of formal education on the economic and social well-being of individuals and society has only received intense statistical study by scholars in the last 15 years, and he emphasized the difficulties involved in such inquiry (p. 9).

The research through 1979 on the economics of education usually dealt with the relationship between education and income. Although Christopher Jencks (1972) estimated that 75 percent of the variations in income was due to luck or to elusive and unmeasurable differences, data available through national census statistics (U.S. Department of Commerce, 1977, pp. 194-212) and other even more extensive analyses presented by Elchanan Cohn (1972, pp. 50-75) clearly demonstrated that there was a remarkably high correlation between education and income level in the United States. The degree to which the level of education attained and other factors are confounded, as Jencks (1972) suggested, led to the development of more statistically elaborate input-output analysis models in education (Cohn, 1972).

The input-output analysis, though in its infancy in 1979, was a useful approach to educational research. It could be expanded to include many input and output variables as research data become available on the larger issue of the economic benefit of the improvement of human capital resources through education. Additional inquiry was needed but, as Leiter (1975) cautioned:

The work of scholars dealing with investment in human capital differs from that of sociologists, psychologists, and educators comparing the schooling of different groups of children mainly in that the former stresses the relationship between more education and higher income rather than the effects of similar education under varying amounts of expenditure. Many unanswered questions remain regarding measurement of the changes in the quality of education as distinguished from variation in the amount of money spent. There is still much work to determine which school inputs are closely associated with increased quality education. (pp. 12-13)

Cost Effectiveness Analysis

Local district inquiry into the cost effectiveness of educational programs was particularly relevant in 1979. Richard Perlman (1973) in The Economics of Education: Conceptual Problems and Policy Issues stated:

In state and local budgets, education is following the path of the military in the federal budget, moving from unquestioning acceptance of authorization requests to demands for greater efficiency in spending tax dollars to serious doubts about the need for such a high basic expenditure level. Neither can any longer claim essentiality as a justification for unlimited outlays. Both are in danger of falling from the status of sacred cows to budgetary pariahs. (p. 4)

Efforts to determine the cost effectiveness of educational programs were not new. Raymond E. Callahan (1962) in his study of educational administration between 1900 and 1930 found extensive efforts during that period to apply business cost accounting procedures to the management of school systems, many with the stated objective of increasing cost effectiveness. He concluded that insufficient time was spent in painstaking, systematic, and expensive research in education and that

the record shows that the effort was not on "producing the finest product" but on the "lowest cost." In all of the efforts which were made to demonstrate efficiency, it was not the evidence of excellence of the "product" which was presented, but data on per pupil costs. (p. 244)

During the post World War II period, the American economy experienced an unprecedented expansionary phase in its demands for goods and services, including education. In education, meeting that demand appeared to be limited only by the amount of funds committed to the task (Johns & Morphet, 1975, p. 95).

Slowly the federal government became directly involved in the financing of public education. Writing on the importance of federal involvement to most school districts, Mort, Reusser, and Rolley (1960) stated that, "Federal influence could be accepted or rejected with little financial gain or loss" (p. 4).

Federal policy in regard to financial assistance for public schools began to emerge with the passage of the Elementary and Secondary Education Act of 1965. Federal expenditure for education increased from \$156,000,000 in 1949-50 to just under \$4,000,000,000 in 1972-73 (Johns and Morphet, 1975, p. 359).

With increased federal involvement in educational finance, mostly for categorical or special interest programs, there was also an increase in congressional concern over the effectiveness of the federally funded educational efforts. A 1975 effort to meet the concern in a formal sense was the Comptroller General's report to Congress entitled Assessment of Reading Activities Funded Under Federal Programs of Aid for the Educationally Disadvantaged which was requested in 1975. A major problem cited in the report was the poor quality of available evaluative data (U. S. Comptroller General, 1975, p. 41). Developing the "painstaking, systematic and expensive research in education," described as needed by Callahan (1962, p. 93), was a very slow process and according to William W. Cooley and Paul R. Lohnes (1976), who were

involved with educational research almost since the beginning of federally funded programs in 1965,

It is inconsistent with the realities of funding of public education to expect the local policy makers to contract for any sizeable portion of the evaluations they require. Certainly Federal and State educational agencies should contract for many evaluations, especially that evaluation which can assist many policy-making locales and levels. (p. 4)

The optimum situation was the type of cooperative efforts among federal, state and local agencies in the area of educational evaluation which was becoming more common in the late 1960's.

Probably the largest evaluation study was conducted by James S. Coleman and six colleagues in 1966 and published in Equality of Educational Opportunity, commonly known as the Coleman Report (Coleman et al., 1966). Relative to that study, Cooley and Lohnes (1976) pointed out two problems inherent in large scale evaluation research efforts:

It is probably naive to think that large and expensive evaluation research will ever be disinterested. Certainly the Equality study was a carefully targeted missile. The surprise was that it backfired. (p. 16)

Many studies did have predetermined results in mind but too frequently the analyzed data did not support the predetermined results.

Volumes have been written on the failure of the Coleman Report to demonstrate clearly what it was supposed to: that the differences in educational output are directly related to differences in the school inputs. Notable authors on the subject included such dissimilar individuals as Jencks (1972), Donald Levine and Mary Jo Barnes (1975), and Frederick Mosteller and Daniel P. Moynihan (1972), just to mention a few. The reanalyses ranged from criticisms of the nature and analysis of the original data to reaffirmation of the original conclusions. In a summary of the results and some of the problems with the original

analyses, which gave rise to the controversies, Cooley and Lohnes (1976) stated:

What they showed, against the expectations of the sponsors, was that in some ways schools are much more equal than had been supposed . . . children are vastly unequal in verbal learning, despite and not because of the schools they attend . . . Apparently the authors failed to collect the right and necessary data on how schools differ.

A disturbing aspect of the Coleman Report is the analysis model which (the step regression model with background measures entered before school measures) colored the resulting generalizations so thoroughly that a respectable alternative generalization with very different policy implications was left unstated.

A major theme of contemporary survey research in education such as the Coleman Report is that the variables that define the environmental context outside the classroom exert extremely powerful and often malevolent influences on the outcome of study within the classroom. (pp. 21-23)

Despite negative reactions to the Coleman Report, many of which were described as self-serving, its importance to the development of evaluation research in education cannot be denied. An aspect of the contribution was well stated by Cohn (1975):

the Coleman Report stands as a bench mark for a number of reasons. More than any other study, it provided an impetus for theorists of all orientations to become involved in what had previously been a very specialized and secure branch of educational research--input-output analysis. (p. 21)

Educational research efforts had, in the 1970's, begun to converge to produce comprehensive research models which systematically measured input and output variables to produce the data on which more valid educational decisions could be based.

Research on the Follow Through Programs, ESAA Pilot Program, and the development of Project Information Packages to disseminate effective ESEA Title I programs were examples of evaluation efforts

in the 1970's which utilized comprehensive models. The difficulties encountered by G. Kasten Tallmadge (1976) in the development of the Project Information Packages were representative of those encountered in the other studies:

The search encompassed 2,000 projects, all of which had received some form of "official" recognition for success. Of the 2,000, only six could be found which, under close scrutiny, were able to meet the selection criteria of effectiveness, cost, availability and replicability, established for the search. Most discouraging was the fact that not any of the evaluations provided acceptable evidence regarding project success or failure. (pp. 1-2)

After that time, Tallmadge and his colleagues (Tallmadge & Wood, 1976), under the auspices of a U. S. Office of Education grant, worked closely with state and local educational agencies to develop an evaluation model for Title I programs. The systems model, which helped program personnel avoid the data collection and analysis pitfalls so prevalent in the past, was mandated for implementation in the evaluation of all Title I programs beginning in 1978. The potential for more effective evaluation research in education, as the data become available nationwide, was outstanding.

There are few examples of educational decisions that have been made on the basis of Title I evaluation data. One major exception was the emphasis on increasing the per-pupil expenditure requirements in Title I and recommending it in other programs, which emerged at least partly as a result of a statewide study in California by Herbert J. Kiesling (1972). Despite his own qualification that the optimal "\$300 per child" figure could only be interpreted as valid in the types of conditions described in the study, an increase in the minimum per-pupil expenditure was mandated in subsequent ESEA Title I guidelines in most states. Efforts were also made to increase the effective per-pupil

expenditure in other federal programs by suggesting that efforts in Follow Through, ESAA, and other educational programs be combined with ESEA Title I efforts whenever possible.

With the spending for education at all levels of government estimated at \$67,000,000,000 in 1976, it was understandable that taxpayers in many areas were in revolt. Levy and bond elections across the country were being defeated with regularity, some even after the schools had been closed for lack of operating funds. One cause of the fiscal difficulties was pinpointed by Cohn (1975) in his introduction:

The basic reason for such fiscal problems has been the ever increasing costs of education--despite a reduction in the rate of increase in enrollment and in some cases an absolute decrease in enrollments--which are related to higher input costs despite little or no improvement in educational productivity. (p. xiii)

The financial pressures in some districts and on some programs were becoming so great that some measure of their productivity had to be presented to the public if they were to survive. Fortunately, much of the basic research had been done in other fields to demonstrate that such analyses could be valid (Dudick, 1972). It was essential that the errors of the early 1900's, discussed by Callahan (1962), not be repeated. Cheap is not necessarily productive. Explaining his use of cost analysis, Cohn (1975) stated:

The assumption underlying this study is that there exists some possible way to reduce input costs without reducing output. . . to produce a greater level of output utilizing the same amount of input. (p. xiii)

Whether the emphasis is for reduced, maintained or even increased expenditures, the criteria for decision making must be based on the educational outcome measure rather than on the measure of financial

input. To accomplish this, models and systems from the private sector must be adapted and utilized in the public sector. Significant progress on such adaptations have already been made by Ying Chuang (1971), and Roy Forbes (1974), together with Kiesling (1972), Gene Wilkinson (1972), and others.

We had, as of 1979, reached the point where extension of cost effectiveness studies was needed to develop models that would provide the data needed by educational policy makers at local and state levels. In most school districts the decision makers chose between program alternatives. Data on the relative cost effectiveness of different alternatives can help them make better decisions. Education researchers can provide these kinds of data; however, the usefulness of the information must be kept in proper perspective. As Forbes (1974) pointed out:

Cost effectiveness analysis does not make decisions. It provides the decision maker with the data which will aid him in making better and more realistic decisions. The decision process remains the prerogative of those responsible and accountable for the planning and the operation of the school system. (p. 22)

CHAPTER III PROCEDURES

The procedures section of the investigation herein is divided into five sections. The first section briefly describes the study environment. Next, the design of the study is discussed followed by a description of the delivery modes utilized in the study. The subsequent sections describe the sources and collection of data and the data analysis procedures.

Study Environment

The study herein was conducted in a small school district in central Florida. In 1979, the district had a total of eight schools: two high schools (grades 9 through 12), two middle schools (grades 6 through 8), two elementary schools (grades K through 5), one primary school (grades K through 2), and one intermediate school (grades 3 through 5). During the 1978-79 school year there were approximately 4,500 students enrolled in the public schools. Thirty-nine percent of the total student population participated in some form of compensatory education. There were 929 students enrolled in the state compensatory programs (grades 7 through 12) and 833 students were enrolled in the federal Title I compensatory programs (grades 1 through 6). Four schools participated in the state program and six schools participated in the federal program.

Study Design

The design used for collecting the data relative to the reading achievement of students was a pretest - posttest control group design

as described in Campbell and Stanley (1963) and can be diagrammed in the following manner:

$$RO_1 \quad X_1 \quad O_2$$

$$RO_3 \quad X_2 \quad O_4$$

The R denotes the random assignment of students to the capital and labor intensive groups. O_1 and O_3 represent the pretest observation, X_1 and X_2 represent the respective treatments of capital intensive delivery mode and labor intensive delivery mode. O_2 and O_4 denote the posttest observations for the capital intensive and labor intensive groups.

Delivery Modes

The basic reading instruction in the district elementary schools takes place in a self-contained, single grade classroom or the students are heterogeneously grouped across classes within a single grade. Class size ranges from 20 to 30 students. The instructional program is a basal reader approach. The district has adopted the Holt, Rinehart and Winston series as the basal reader. The teachers usually follow the teaching suggestions in the teacher's manual, they utilize the publisher's management system, and augment with their own strategies and materials.

Although the prime mode of instruction is small group, in most classes a portion of the reading time each day is spent on total group instruction. Most teachers have from three to five permanent reading groups and there is usually little mobility between groups.

The district list of sequenced reading skills for grades one through five is utilized as an instructional guide in most classes. Diagnostic test information on individual student deficiencies in those skills provides direction for the instructional program.

The Title I program provides small group and individualized instruction for an average of 250 minutes per week, for children with low-measured achievement in reading. Students are taken from the classroom to a reading laboratory where individualized and tutorial instruction is provided by the Title I teachers and tutors. Title I teachers and tutors meet regularly with classroom teachers to coordinate the remedial efforts outside the classroom with the classroom instructional program.

The single district school selected for the proposed study had two Title I reading laboratories during the 1979 fiscal year. One of the laboratories was organized in a capital intensive delivery mode and the other was organized in a labor intensive delivery mode.

Title I Capital Intensive Delivery Mode. The capital intensive delivery mode consists of a set of planned, individualized, and programmed procedures in which people and machine are used in an integrated manner to achieve results. The program utilized in the capital intensive laboratory was developed by Hoffman Informations Systems, an El Monte California producer and publisher of individualized reading and math learning systems. The individualized approach allows each student to progress at his or her own pace.

The Hoffman System is a multi-sensory approach to learning, specifically designed for kindergarten through sixth grade levels. Materials include audio visual aids, workbooks and worksheets, headphones and extended learning activities. Classes are structured so one group of students is involved with viewer materials, another in oral or silent reading and still another working with reinforcement materials and workbooks. By integrating technology into the curriculum, teachers and

tutors are able to reach more children than where services are delivered in a labor intensive mode. Therefore, the Title I teacher has been assigned to the laboratory for an average of two hours per day and tutors have been assigned on a ratio of one tutor per eight students per period.

Title I Labor Intensive Delivery Mode. The labor intensive delivery mode is a method of delivering services where the greatest monetary expenditure for input is for human effort. One Title I teacher is assigned to the laboratory and tutors are assigned on a ratio of one tutor for every four students per period.

The teacher and tutors serve students in small groups utilizing materials of their choice including large numbers of ditto sheets, supplementary readers, and workbooks. The usual procedure followed is that of introducing a reading skill to the group of students followed by intact groups with the adult implementing those skills identified by the LEA teacher. There is little attempt to provide an integrated, sequential skills program.

Sources and Collection of Data

The total Title I population of the selected Title I school in the district was randomly assigned to the capital intensive and the labor intensive treatment groups by utilizing a table of random numbers.

The instrument used in collecting data on student's reading achievement was the California Achievement Test. Individual student total reading scores were collected from the computer printouts provided to the district from the McGraw Hill scoring service. The test was administered in October, 1978, and April, 1979, within two weeks of the fall and spring norming dates using the same form and level of the test.

for pre and post testing. Mental ability data were collected using the Slosson Intelligence Test administered in September, 1978.

The personal social variable data of sex and race were taken from the student's permanent record folders housed in the school central office.

Cost data were limited to the cost of Title I teachers, tutors, supplies, materials, and equipment for the individual Title I laboratories in the selected school during the 1979 fiscal year. The data were obtained from the financial records in the Title I district office where expenditures were broken down by individual school laboratory function and object categories.

Factors and levels. The study herein was limited to five factors and their respective levels as delineated below.

Factor A: Delivery mode for services (treatment)

1. labor intensive delivery mode
2. capital intensive delivery mode

Factor B: Sex

1. male
2. female

Factor C: Race

1. black
2. white

Factor D: Socioeconomic level

1. low (free or reduced lunch program)
2. average or above average (student pays for own lunch)

Factor E: Ability level

1. ability (entered as a continuous variable)

Data Analysis

The primary data analysis technique utilized was multiple regression analysis. The technique was used to test the effect of the independent variables on the dependent variable as well as the interaction among and between the variables. Specifically, the mean achievement residual gain scores for students in the capital intensive group were compared with mean achievement residual gain scores for students in the labor intensive group. The mean achievement residual gain score for each of the two groups was compared for differences between the levels of race, socioeconomic level, sex, and ability level. The mean achievement residual gain score for each of the two groups was compared for differences as a result of the interaction between and among the variables of mode of delivery, sex, race, socioeconomic level, and ability level.

The data analysis technique utilized in the cost effectiveness analysis was a t test for the difference between means. Specifically, a cost effectiveness index was calculated for each student in the sample and cost effectiveness means were calculated for each delivery mode. The t test analysis was used to test the significance of the difference between the means.

CHAPTER IV DATA ANALYSIS AND INTERPRETATION

There is no widely accepted standard model for cost effectiveness analysis in education even though research has shown that the approach is feasible. The researcher found, in the review of the literature, that most of the data available comparing the cost effectiveness of alternative programs was a result of large scale, federally funded, state or national evaluations. Considerable evidence from the studies indicates that dollar expenditure alone does not increase student achievement and that those programs having the greatest positive impact on student achievement are not necessarily those for which the greatest expenditures are made.

Large scale national evaluations have been primarily conducted as a result of legislative mandate. The resulting information has had some effect on national and state decisions but, in general, has had little effect on school district educational policies or decisions. Yet, it is primarily at the school district and school level where most of the program decisions are made. The information on specific relationships at the school district or school level is lost in the state or nationwide studies because of the analysis procedures which must be used for such large diverse samples.

The study presented herein attempts to adapt the models which have been developed in large scale studies to assess and compare the cost effectiveness of two modes of delivering reading services to compensatory

students in grades one through five in one elementary school in Sumter County, Florida School District.

Data Analysis

Seven hypotheses were posed for the study and program data, as reported in Appendix A, were analyzed to determine the confidence which could be placed in the hypotheses. Each of the hypotheses will be discussed in the following paragraphs.

Hypothesis 1. There are no significant differences in reading achievement between students receiving Title I services in a capital intensive delivery mode and students receiving services in a labor intensive delivery mode when holding constant the variates of sex, race, socioeconomic status, and ability.

Scores on two reading subtests and the total reading score of the California Achievement Test were utilized as the criterion measures for student reading achievement. The test is administered by the Title I teacher in October and April within two weeks of the empirical normative testing dates. All students included in the study were tested in that setting during the 1979 fiscal year. Raw scores were converted to standard National Curve Equivalency scores for the purpose of analysis. The same level and form of the test was administered at pretest and posttest times.

The data relating to student characteristics included in the analysis (independent variables) were reading teacher, sex, race, socioeconomic status, ability, and pretest score. Sex, race, delivery mode, and socioeconomic status were entered as dummy variables with two classifications. Reading teacher was entered as a 13 classification dummy variable, and ability as a dummy variable with three classifications. Pretest standard score was entered as a continuous variable.

The relationship between the independent variables and reading achievement for the total population was analyzed using the GLM

procedure in the SAS program (Barr, Goodnight, Sall, and Hellwig, 1976, pp. 127-144). The GLM procedure uses the principle of least squares to fit a fixed-effects linear model to the data. The results of the analysis for the Vocabulary and Comprehension subtests and the Total Reading test are reported in Tables 1-6.

Tables 1, 2, and 3 depict the results of the analysis of variance which tested for the effect of the model entered in the analysis.

TABLE 1
ANALYSIS OF VARIANCE TESTING THE EFFECT OF THE MODEL:
VOCABULARY SUBTEST

Source	df	SS	MS	F	p
Model	18	9189.97	510.55	5.83	0.0001 *
Error	113	9893.02	87.55		
Corrected Total	131	19082.99			

* $p < .05$.

$R^2 = .482$.

TABLE 2
ANALYSIS OF VARIANCE TESTING THE EFFECT OF THE MODEL:
COMPREHENSION SUBTEST

Source	df	SS	MS	F	p
Model	18	11091.88	616.22	4.41	0.0001 *
Error	112	15658.12	139.81		
Corrected Total	130	26750.00			

* $p < .05$.

$R^2 = .42$.

TABLE 3
ANALYSIS OF VARIANCE TESTING THE EFFECT OF THE MODEL:
TOTAL READING

Source	df	SS	MS	F	p
Model	18	8445.99	469.22	6.26	0.0001*
Error	112	8388.85	74.90		
Corrected Total	130	16834.84			

*p < .05

R² = .50.

Significant F ratios are indicated for the model (see Appendix B) effects. A significant F ratio is indicated for Vocabulary subtest, as reported in Table 1. Table 2 reports a significant F ratio for Comprehension subtest. Table 3 reports a significant F ratio for Total Reading. The model, further, explains 48 percent of the variance in Vocabulary scores as indicated by the R² value. The model explains 42 percent of the variance in Comprehension scores as indicated by the R² value. Fifty percent of the variance in Total Reading scores can be attributed to the model as indicated by the R² value.

Multiple regression analysis was used to test the significance of the difference in reading achievement between students in each of the delivery modes while holding constant the variables of sex, race, socioeconomic status, ability, and reading teacher. The results of the analysis are reported in Tables 4, 5, and 6. The delivery mode F ratios reported for each of the criterion variables are not significant at the .05 alpha level.

TABLE 4
TESTS OF SEPARATE EFFECTS OF THE INDEPENDENT VARIABLES
IN RELATION TO VOCABULARY SUBTEST

Variable	SS	df	F	p
LEA Teacher of Student	64.66	1	0.74	0.3919
Grade of Student	213.64	4	0.61	0.6562
Sex of Student	183.16	1	2.09	0.1508
Race of Student	42.66	1	0.49	0.4866
SES of Student	243.59	1	2.78	0.0981
Ability of Student	720.02	1	8.22	0.0049 *
Vocabulary Pretest	3685.34	1	42.09	0.0001 *
Delivery Mode	4.80	1	0.05	0.8154
SES by Delivery Mode	115.51	1	1.32	0.2531
Sex by Delivery Mode	55.88	1	0.64	0.4260
Race by Delivery Mode	328.67	1	3.75	0.0500 *
Grade by Delivery Mode	316.39	4	0.90	0.4645

* $p < .05$.

TABLE 5

TESTS OF SEPARATE EFFECTS OF THE INDEPENDENT VARIABLES
IN RELATION TO COMPREHENSION SUBTEST

Variable	SS	df	F	p
LEA Teacher of Student	72.78	1	0.52	0.4721
Grade of Student	1998.25	4	3.51	0.0088 *
Sex of Student	1485.80	1	10.63	0.0015 *
Race of Student	770.06	1	5.51	0.0207 *
SES of Student	27.85	1	0.20	0.6562
Ability of Student	1978.31	1	14.15	0.0003 *
Comprehension Pretest	1646.84	1	11.78	0.0008 *
Delivery Mode	0.14	1	0.00	0.9747
SES by Delivery Mode	2.78	1	0.02	0.8881
Sex by Delivery Mode	693.07	1	4.96	0.0280 *
Race by Delivery Mode	258.02	1	1.85	0.1770
Grade by Delivery Mode	740.87	4	1.32	0.2651

* $p < .05$.

TABLE 6

TESTS OF SEPARATE EFFECTS OF THE INDEPENDENT VARIABLES
IN RELATION TO TOTAL READING

Variable	SS	df	F	p
LEA Teacher of Student	95.27	1	1.27	0.2613
Grade of Student	608.00	4	2.03	0.0951
Sex of Student	148.19	1	1.98	0.1623
Race of Student	66.43	1	0.89	0.3484
SES of Student	1.86	1	0.02	0.8750
Ability of Student	439.72	1	5.87	0.0170 *
Total Reading Pretest	3968.43	1	52.98	0.0001 *
Delivery Mode	9.45	1	0.13	0.7231
SES by Delivery Mode	177.09	1	2.36	0.1270
Sex by Delivery Mode	172.39	1	2.30	0.1321
Race by Delivery Mode	50.28	1	0.67	0.4144
Grade by Delivery Mode	551.58	4	1.84	0.1259

* $p < .05$.

Hypotheses 2-5. There are no significant differences in reading achievement between the levels of sex, race, socioeconomic status, or ability when holding constant the alternate variables of race, sex, socioeconomic status, and ability.

Multiple regression analysis was used to test the significance of differences between the levels of each of the independent variables. Each result was obtained after all other variables were controlled. The results of the analyses are reported in Tables 4, 5, and 6. A significant F ratio, as reported in Table 7, is indicated for the sex effects ($F=10.63$, $p<.05$) for the Comprehension subtest. The significant F ratio indicates that the means, reported in Table 8, are different.

TABLE 7
ANALYSIS OF VARIANCE TEST FOR EFFECT OF SEX

Source	SS	df	F	p
Vocabulary Subtest	183.16	1	2.09	0.151
Comprehension Subtest	1485.80	1	10.63	0.002 *
Total Reading	148.19	1	1.98	0.162

* $p<.05$.

TABLE 8
MEANS AND STANDARD ERRORS FOR SEX:
COMPREHENSION SUBTEST

Group	LS Means	Std Err
Boys	29.03	1.71
Girls	36.80	2.17

The results of the analysis of variance used to test the effect of race on reading achievement are reported in Table 9. A significant F

ratio is indicated for the race effects ($F=5.51$, $p<.05$). The significant F ratio indicates that the means, reported in Table 10, are different.

TABLE 9
ANALYSIS OF VARIANCE TEST FOR EFFECT OF RACE

Source	SS	df	F	p
Vocabulary Subtest	42.66	1	0.49	0.487
Comprehension Subtest	770.06	1	5.51	0.021 *
Total Reading	66.43	1	0.89	0.348

* $p<.05$.

TABLE 10
MEANS AND STANDARD ERRORS FOR RACE:
COMPREHENSION SUBTEST

Group	LS Means	Std Err
Black	35.66	2.18
White	30.18	1.67

The results of the analysis of variance used to test the significance of the effect of socioeconomic status on reading achievement are reported in Table 11. There were no significant F ratios, at the .05 alpha level, for the three criterion variables.

The results of the analysis of variance used to test the significance of the effect of ability on reading achievement are reported in Table 12. Significant F ratios are indicated for the ability effects

for Vocabulary subtest, Comprehension subtest, and Total Reading ($F=8.22$, $F=14.15$, $F=5.87$, $p<.05$). The significant F ratios indicate that the mean scores are different for different levels of the ability factor.

TABLE 11

ANALYSIS OF VARIANCE TEST FOR EFFECT OF SOCIOECONOMIC STATUS

Source	SS	df	F	p
Vocabulary Subtest	243.59	1	2.78	0.098
Comprehension Subtest	27.85	1	0.20	0.656
Total Reading	1.86	1	0.02	0.875

TABLE 12

ANALYSIS OF VARIANCE TEST FOR EFFECT OF ABILITY

Source	SS	df	F	p
Vocabulary Subtest	720.02	1	8.22	0.0058 *
Comprehension Subtest	1978.31	1	14.15	0.0003 *
Total Reading	439.20	1	5.87	0.017 *

* $p<.05$.

Hypothesis 6. There is no significant interaction between and among alternative delivery modes and race, sex, socioeconomic status, or grade as they relate to reading achievement.

Multiple regression analysis was used to test the significance of the interaction of effects between and among the delivery mode and race, sex, socioeconomic status, and ability. The results of the analyses are reported in Tables 4, 5, and 6. A significant F ratio is indicated for the interaction of delivery mode and race effects for Vocabulary subtest,

as reported in Table 13 ($F=3.75$, $p<.05$). The significant F ratio indicates that the mean scores, reported in Table 14, are different.

TABLE 13
ANALYSIS OF VARIANCE TEST FOR EFFECT OF INTERACTION OF DELIVERY
MODE AND RACE

Source	SS	df	F	p
Vocabulary Subtest	328.67	1	3.75	0.050 *
Comprehension Subtest	258.02	1	1.85	0.177
Total Reading	50.27	1	0.67	0.414

* $p<.05$.

TABLE 14
MEANS AND STANDARD ERRORS FOR DELIVERY MODE AND
RACE INTERACTION: VOCABULARY SUBTEST

Group	Capital Intensive Delivery Mode	Labor Intensive Delivery Mode
Black	$\bar{X}=35.33$ SE= 2.18	$\bar{X}=26.24$ SE= 5.58
White	$\bar{X}=29.39$ SE= 1.80	$\bar{X}=34.46$ SE= 2.67

The results of the analysis of variance to test the significance of the interaction of effects between and among the delivery mode and sex are reported in Table 15. A significant F ratio is indicated for the interaction of delivery mode and sex effects for Comprehension subtest ($F=4.96$, $p<.05$). The significant F ratio indicates that the mean scores, as reported in Table 16, are different.

TABLE 15

ANALYSIS OF VARIANCE TEST FOR EFFECT OF INTERACTION OF
DELIVERY MODE AND SEX

Source	SS	df	F	p
Vocabulary Subtest	55.88	1	0.64	0.426
Comprehension Subtest	693.07	1	4.96	0.028 *
Total Reading	172.39	1	2.30	0.132

* $p < .05$.

TABLE 16

MEANS AND STANDARD ERRORS FOR DELIVERY MODE AND SEX
INTERACTION: COMPREHENSION SUBTEST

Group	Capitlal Intensive Delivery Mode	Labor Intensive Delivery Mode
Boys	$\bar{X}=32.25$ SE= 2.54	$\bar{X}=27.19$ SE= 3.16
Girls	$\bar{X}=32.77$ SE= 2.57	$\bar{X}=36.83$ SE= 4.86

The results of the analysis of variance to test the significance of the interaction between and among the delivery mode and socioeconomic status are reported in Table 17. There are no significant F ratios reported.

The result of the analysis of variance to test the significance of the interaction between and among the delivery mode and ability is reported in Table 18. There are no significant F ratios reported.

TABLE 17

ANALYSIS OF VARIANCE TEST FOR EFFECT OF INTERACTION OF
DELIVERY MODE AND SOCIOECONOMIC STATUS

Source	SS	df	F	p
Vocabulary Subtest	115.51	1	1.32	0.253
Comprehension Subtest	2.78	1	0.02	0.888
Total Reading	117.09	1	2.36	0.127

TABLE 18

ANALYSIS OF VARIANCE TEST FOR EFFECT OF INTERACTION OF
DELIVERY MODE AND ABILITY

Source	SS	df	F	p
Vocabulary Subtest	316.39	4	0.90	0.465
Comprehension Subtest	740.87	4	1.32	0.265
Total Reading	551.58	4	1.84	0.126

Hypothesis 7. There is no significant difference in cost effectiveness indices between the Capital Intensive delivery mode and the Labor Intensive delivery mode when using reading achievement as the measure of effectiveness.

The compilation of cost data required that the researcher make decisions as to what should be included as program expense and the most representative way of including common expenditures. The criterion for inclusion was that the expenditure be directly related to providing instructional services for the sample students.

The Sumter County School District utilizes the statewide accounting system. The system groups expenditure data into the standard accounts

of administration, instruction, materials and supplies, operation and maintenance of plant, capital expenditure, food service, and transportation. The Sumter County federally funded Title I program also utilizes the statewide standard accounting system.

No federal Title I monies were expended for operation and maintenance of plant, capital expenditure, food services, or transportation. Local district funds expended and charged to the above district accounts and Title I federal funds expended for administration were equal for each of the groups in the study. The researcher determined that, for the purpose of the study, only those instructional costs of teacher salaries, tutor salaries, fringe benefits, and staff development would be included as program instructional costs.

All expenditures during the 1979 fiscal year for materials, supplies, and equipment were included in the cost data. The expected life of items for each category was estimated in order to amortize the start up expenditures for each of the delivery modes. The estimation was based on previous utilization of the same or similar items used in the school system. The total amortized start up cost for each of the delivery modes is reported in Table 19 and Table 20.

TABLE 19

AMORTIZATION OF START UP EXPENDITURES:
CAPITAL INTENSIVE DELIVERY MODE

Object/ Function	Category	Start Up Expenditure	Years of Amortization	Amortized Expenditure
51-51	Supplies	899	0	899
51-62	Non Consumables	5461	5	1092
51-64	AV Equipment	2753	8	344
TOTAL AMORTIZED EXPENSE				2335

TABLE 20
AMORTIZATION OF START UP EXPENDITURES:
LABOR INTENSIVE DELIVERY MODE

Object/ Function	Category	Start Up Expenditure	Years of Amortization	Amortized Expenditure
51-51	Supplies	953	0	953
51-62	Non Consumables	2853	5	571
51-64	AV Equipment	1959	8	245
TOTAL AMORTIZED EXPENSE				1769

One Title I teacher was assigned to the two delivery mode groups included in the study. The teacher was assigned to the Capital Intensive delivery mode group for 2/3 of her time. A total of seven tutors took part in the study. Four tutors were assigned to the Capital Intensive group and three were assigned to the Labor Intensive group. The total salary and fringe benefit expenditures for each of the delivery mode groups are reported in Table 21 and Table 22.

TABLE 21
SALARY AND FRINGE BENEFITS:
CAPITAL INTENSIVE DELIVERY MODE

Object/ Function	Category	Units	Cost Per Unit	Program Expenditure
51-10	Teacher Salary	1/3	12000	4000
51-10	Tutor Salary	4	2780	11120
51-20	Teacher Fringe	1/3	2040	680
51-20	Tutor Fringe	4	473	1892
TOTAL SALARY AND FRINGE				17692
AVERAGE COST PER UNIT				4086

TABLE 22
SALARY AND FRINGE BENEFITS:
LABOR INTENSIVE DELIVERY MODE

Object/ Function	Category	Units	Cost Per Unit	Program Expenditure
51-10	Teacher Salary	2/3	12000	8000
51-10	Tutor Salary	3	2780	8340
51-20	Teacher Fringe	2/3	2040	1360
51-20	Tutor Fringe	3	473	1413
TOTAL SALARY AND FRINGE				19113
AVERAGE COST PER UNIT				5222

Expenditures related to staff development were computed by dividing the Title I staff development expenditure in each category by the total number of Title I personnel. The resulting quotient represents a staff development cost per personnel unit. The cost per unit was then multiplied by the number of units assigned to a delivery mode group, resulting in a total expenditure for each category by group. The expenditures for staff development included purchased services (consultants), supplies, and audiovisual materials. Staff development costs for each delivery mode group are reported in Table 23 and Table 24.

TABLE 23
STAFF DEVELOPMENT:
CAPITAL INTENSIVE DELIVERY MODE

Object/ Function	Category	Units	Cost Per Unit	Group Expenditure
64-31	Purchased Services	4.33	17	74
64-51	Supplies	4.33	12	52
64-62	AV Non Consumable	4.33	8	35
TOTAL STAFF DEVELOPMENT				161

TABLE 24
STAFF DEVELOPMENT:
LABOR INTENSIVE DELIVERY MODE

Object/ Function	Category	Units	Cost Per Unit	Group Expenditure
64-31	Purchased Services	3.66	17	62
64-51	Supplies	3.66	12	44
64-62	AV Non Consumable	3.66	8	29
TOTAL STAFF DEVELOPMENT				135

The compilation of all program costs by group are reported in Table 25 and Table 26. The tables include total expenditure by group for amortized start up, salaries and fringe benefits, staff development, and indirect cost. The indirect cost rate for the 1979 fiscal year was .0823. Mean program costs by group are reported in Table 27.

TABLE 25
FY-79 TOTAL EXPENDITURES:
CAPITAL INTENSIVE DELIVERY MODE

Category	Expenditure
Amortized Start Up	2335
Salaries and Fringe Benefits	17692
Staff Development	161
Indirect Cost	1540
TOTAL PROGRAM EXPENDITURE 21728	

TABLE 26

FY-79 TOTAL EXPENDITURES:
LABOR INTENSIVE DELIVERY MODE

Category	Expenditure
Amortized Start Up	1769
Salaries and Fringe Benefits	19113
Staff Development	135
Indirect Cost	1662
TOTAL PROGRAM EXPENDITURES 22679	

TABLE 27

MEAN COST BY GROUP

Group	N	Cost	Mean Cost
Capital Intensive	83	21728	262
Labor Intensive	52	22679	436

The SAS program (Barr et al., 1976) was utilized to compute a cost effectiveness index (CE) for each student in the sample. The T Test Procedure (Barr et al., 1976, pp. 275-277) was then applied to the data in order to test the hypothesis that there was no significant difference in the CE means of the Labor Intensive and Capital Intensive groups. Results of the analysis are reported in Table 28.

TABLE 28
TEST FOR DIFFERENCE IN CE MEANS

Group	N	CE Mean	Std Dev	df	T	p
Labor Intensive	52	32.96	240.22	132	0.572	0.57
Capital Intensive	83	10.56	207.59			

Interpretation

Hypothesis 1. There are no significant differences in reading achievement between students receiving Title I services in a Capital Intensive delivery mode and students receiving services in a Labor Intensive delivery mode when holding constant the variates of sex, race, socioeconomic status, and ability.

The F ratios reported in the results of the analysis of variance used to test the effects of delivery mode on Vocabulary subtest ($F=0.05$, $p>.05$), Comprehension subtest ($F=0.98$, $p>.05$), and Total Reading ($F=0.13$, $p>.05$) are less than what would be expected by chance. The F ratios indicate that the mean scores for each of the groups on each dependent variable are not significantly different. Therefore, the null hypothesis of no significant difference in reading achievement between students receiving services in alternative delivery mode groups is accepted.

Hypothesis 2. There are no significant differences in reading achievement between the two levels of sex, holding constant the variables of race, socioeconomic status, and ability.

The F ratios reported in the results of the analysis of variance used to test the effect of sex on Vocabulary subtest ($F=2.09$, $p>.05$) and Total Reading ($F=1.98$, $p>.05$) are less than would be expected by chance. The F ratios indicate that the means are not significantly different. The F ratio for the effect of sex on the Comprehension

subtest ($F=10.63$, $p < .05$) is greater than would be expected by chance. The F ratio indicates that the means for boys ($\bar{X}=29.03$) and girls ($\bar{X}=36.80$) are significantly different. The indication is that girls did better than boys no matter which delivery mode they had been assigned to as a group member. Therefore, the null hypothesis of no significant difference in reading achievement between the two levels of sex is rejected for Comprehension subtest but not for Vocabulary subtest and Total Reading.

Hypothesis 3. There are no significant differences in reading achievement between the two levels of race holding constant the variables of sex, socioeconomic status, and ability.

The F ratios reported in the results of the analysis of variance used to test the effect of race on Vocabulary subtest ($F=0.49$, $p > .05$) and Total Reading ($F=0.89$, $p > .05$) are less than would be expected by chance. The F ratio for the effect of race on Comprehension subtest ($F=5.51$, $p < .05$) is greater than would be expected by chance. The F ratio indicates that the means for blacks ($\bar{X}=35.66$) and whites ($\bar{X}=30.18$) are significantly different. The indication is that blacks did better than whites no matter which delivery mode they had been assigned to as a group member. Therefore, the null hypothesis of no significant difference in reading achievement between the two levels of race is rejected for the Comprehension subtest but not for the Vocabulary subtest and Total Reading.

Hypothesis 4. There are no significant differences in reading achievement between the two levels of socioeconomic status holding constant the variables of sex, race, and ability.

The F ratios reported in the results of the analysis of variance used to test the effect of socioeconomic status on Vocabulary subtest ($F=2.79$, $p > .05$), Comprehension subtest ($F=0.20$, $p > .05$), and Total Reading ($F=0.02$, $p > .05$) are less than would be expected by chance. The F

ratios indicate that the means for low socioeconomic status are not significantly different from the means for average and above average socioeconomic status. Therefore, the research findings support the null hypothesis of no significant difference in reading achievement between the two levels of socioeconomic status.

Hypothesis 5. There are no significant differences in reading achievement between the levels of ability holding constant the variables of sex, race, and socioeconomic status.

The F ratios reported in the results of the analysis of variance used to test the effect of ability on Vocabulary subtest ($F=8.22$, $p<.05$), Comprehension subtest ($F=14.15$, $p<.05$), and Total Reading ($F=5.87$, $p<.05$) are greater than would be expected by chance. The F ratios indicate that there is at least one significant difference between a set of two of the means being studied. Therefore, the null hypothesis of no significant difference in reading achievement between the levels of ability is rejected for Vocabulary subtest, Comprehension subtest, and Total Reading.

Hypothesis 6. There is no significant interaction between and among alternative delivery modes and sex, race, socioeconomic status, or ability as they relate to reading achievement.

Sex. The F ratios reported in the analysis of variance used to test the interaction of effects between and among the delivery mode and sex on Vocabulary subtest ($F=0.64$, $p>.05$) and Total Reading ($F=2.30$, $p>.05$) are less than would be expected by chance. The F ratios indicate that the interactive means are not significantly different. The F ratio for the interaction of effects between and among the delivery mode and sex on Comprehension subtest ($F=4.96$, $p<.05$) is greater than would be expected by chance. The F ratio indicates that there is at least one significant difference between a set of two of the means being studied. It is

indicated that girls performed better than boys regardless of delivery mode group and performed best when they had been exposed to the Labor Intensive delivery mode. The boys performed best when they were exposed to the Capital Intensive delivery mode. Therefore, the null hypothesis of no significant interaction between and among alternative delivery modes and sex is rejected for the Vocabulary subtest and Total Reading but not for the Comprehension subtest.

Race. The F ratios reported in the results of the analysis of variance used to test interaction of effects between and among the delivery mode and race on Comprehension subtest ($F=1.85$, $p>.05$) and Total Reading ($F=0.67$, $p>.05$) are what would be expected by chance. The F ratio for the interaction of effects between and among the delivery mode and race on the Vocabulary subtest ($F=3.75$, $p< .05$) is greater than would be expected by chance. The F ratio indicates that there is at least one significant difference between a set of two of the means being studied. It is indicated that blacks performed best when exposed to the Capital Intensive delivery mode and whites performed best when exposed to the Labor Intensive delivery mode. Therefore, the null hypothesis of no significant interaction between and among alternative delivery modes and race is rejected for the Comprehension subtest and Total Reading but not for the Vocabulary subtest.

Socioeconomic status. The F ratios reported in the results of the analysis of variance used to test interaction of effects between and among the delivery mode and socioeconomic status on Vocabulary subtest ($F=1.32$, $p>.05$), Comprehension subtest ($F=0.02$, $p>.05$), and Total Reading ($F=0.02$, $p>.05$) are what would be expected by chance. The F ratios indicate that the means are not significantly different. The null

hypothesis of no significant interaction between and among alternative delivery modes and socioeconomic status is accepted for each of the criterion variables.

Ability. The F ratios reported in the results of the analysis of variance used to test interaction of effects between and among the delivery mode and ability on Vocabulary subtest ($F=0.90$, $p>.05$), Comprehension subtest ($F=1.32$, $p>.05$), and Total Reading ($F=1.84$, $p>.05$) are what would be expected by chance. The F ratios indicate that the interaction means are not significantly different. Thus, the null hypothesis of no significant interaction between and among delivery modes and ability is accepted for each of the criterion variables.

Hypothesis 7. There is no significant difference in cost effectiveness indices between the Capital Intensive delivery mode and the Labor Intensive delivery mode when using reading achievement as the measure of effectiveness.

The t statistic reported in the results of the analysis for the difference in cost effectiveness means is not significant at the .05 alpha level. The obtained t statistic suggests that the means are not significantly different. Therefore, the null hypothesis of no significant difference in cost effectiveness means between students receiving services in alternative delivery mode groups is accepted.

The data analysis results for Vocabulary subtest indicate that the null hypotheses for the main effects of ability and pretest, and the interactive effect of delivery mode and race are rejected at the .05 alpha level. The results for Comprehension subtest indicate that the main effects of grade, sex, race, ability, and pretest; and the interactive effect of delivery mode and sex are rejected at the .05 alpha level. The results for Total Reading indicate that the null hypothesis for the main effects of ability and pretest are rejected at the .05 alpha level.

CHAPTER V
SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

Summary

The facets of the problem investigated in the study were to determine if there were differences in reading achievement of Title I students, in a single school, who were provided services by two different modes of delivery; to determine if the variables of sex, race, ability, and socioeconomic status had a significant effect on the reading achievement of students; and to determine if there were differences in the cost effectiveness indices for each of the delivery modes.

The sample population included all of the Title I identified students (N=133) in one school in the district during the 1979 fiscal year. The students were randomly assigned to a Capital Intensive delivery mode group and a Labor Intensive delivery mode group. The criterion for program effectiveness was residual score for reading achievement as measured by the California Achievement Test.

The compilation of cost data required that the researcher make decisions as to what should be included as program expense and the most representative way of including common expenditures. The assumption was made that local district funds expended and charged to operation and maintenance of plant, capital expenditure, food services, transportation, and administration were equal for each of the groups in the study. Cost data collected for the study included expenditures for salaries, materials and supplies, indirect cost, and staff development.

The primary data analysis techniques utilized were multiple regression analysis and t test for difference between means. The

multiple regression analysis was used to test the effect of the delivery mode, race, sex, socioeconomic status, and ability on the dependent variables of Vocabulary subtest, Comprehension subtest, and Total Reading scores on the California Achievement Test. The t test was used to test the significance of the difference in mean cost effectiveness indices for each of the delivery modes.

The results of the multiple regression analysis indicate that the model (see Appendix B) entered in the analyses explained approximately 48 percent of the variance in Vocabulary scores, 42 percent of the variance in Comprehension scores, and 50 percent of the variance in Total Reading scores.

The main effects for delivery mode were not significant at the .05 alpha level across the criterion variables. Thus, it is indicated that assignment to either of the delivery mode groups made little difference when using reading scores on the California Achievement Test as the criterion for effectiveness.

A preponderance of the research on student achievement suggests that there is a higher than chance relationship between student achievement and certain student characteristics. Those characteristics most frequently found to be so related are the race, sex, socioeconomic status, ability, and initial achievement level of the student. The multiple regression analysis indicated that some of the student characteristics used for the study were predictive of reading achievement for the total population. The main effects for ability and pretest scores were significant at the .05 alpha level across the three criterion variables. The main effects for grade of student, sex, and race were predictive of reading achievement when using Comprehension score as the criterion.

The F ratio for the interaction of effects for race and delivery mode suggests that there is at least one significant difference between the sets of means studied for the Vocabulary subtest. The analysis for Comprehension subtest shows a significant interaction effect for sex and delivery mode at the .05 alpha level. Again, the F ratio suggests at least one significant difference between the sets of means studied.

The procedure used for the cost effectiveness analysis was a t test for the difference between means. The t statistic reported in the analysis is not significant at the .05 alpha level. Therefore, the research findings support the null hypothesis of no significant difference for the cost effectiveness indices.

Implications

The study included both program and cost comparisons. The interpretation of the data analysis, presented in the study, suggests implications on both program and expenditure issues. Each of the implications presented below must be considered within the limitations of the study.

1. The delivery modes, utilized in the study, for providing instructional services to compensatory students do not significantly affect the students reading achievement.

2. The reading achievement of compensatory students is affected more by their sex, race, ability, and initial achievement level than by the assignment to a Capital Intensive or Labor Intensive delivery mode.

3. A student's ability level and initial achievement level are probably two of the best predictors of success in a compensatory reading program. Those students with the most ability and the highest initial achievement level will be the most successful.

4. A student's sex and race are significant predictors of comprehension achievement in a compensatory reading program. Sex and race do not significantly affect reading achievement for lower order cognitive skills (vocabulary). As the student is exposed to higher order cognitive skills (comprehension), sex and race significantly affect the achievement. For the higher order cognitive skills, girls perform better than boys and blacks perform better than whites. The researcher assumes that the higher performance of black students is a result of the effects of the interaction of the delivery mode and race.

5. Socioeconomic status does not significantly affect the reading achievement of elementary compensatory students. Some researchers report socioeconomic status as a significant predictor of achievement. This researcher postulates that it is not the socioeconomic status that is a controlling variable, but that socioeconomic status is a result of the totality of the personal characteristics of the student and the student's family. Once the effects of the personal characteristics were controlled in the study, socioeconomic status showed no effect.

6. Girls perform best when exposed to a delivery mode that provides the most personal contact with adults. Boys, on the other hand, perform best when exposed to a delivery mode whereby people and machines are used in an integrated manner to achieve results.

7. White students perform best when exposed to a delivery mode that provides the most personal contact with adults. Black students perform best when exposed to a delivery mode whereby people and machines are used in an integrated manner to achieve results.

8. The research findings suggest that there is no significant difference in the cost effectiveness indices for the Capital Intensive

delivery mode and the Labor Intensive delivery mode when a t test for the difference between means was applied to the data. Most of the research dealing with cost effectiveness has compared the cost effectiveness indices of alternative programs without subjecting the data to statistical analysis. The researchers postulate that low ratios indicate gains are being purchased more efficiently than gains associated with higher ratios. If the above criteria had been applied to the present study, it would have been assumed that the Capital Intensive delivery mode was more cost effective than the Labor Intensive delivery mode.

Recommendations

The following recommendations are based on the results of the study herein presented.

1. The consideration of personal characteristics when assigning students to learning centers in the classroom may well prove to be beneficial. It would seem appropriate to assign students to learning centers utilizing modes of delivering services that the study has shown provides the best opportunity for achievement for students with particular personal characteristics.

2. Schools cannot effectively control many of the variables that have been associated with student achievement. The study herein presented included several of these identified variables. The variables used in the model accounted for approximately 50 percent of the variance in reading achievement scores but included no within school variables that were significant. There is still approximately 50 percent of unexplained variance. The within school variables, which may be more easily

controlled by the district administrators and district policy, may exert a greater influence on achievement than the more generalized student characteristics. More research needs to be done using additional within school variables.

3. More research needs to be done on the impact of compensatory instruction efforts to determine the relative level of achievement gain of compensatory students when compared to those students who do not receive compensatory instruction. The study herein presented did not attempt to compare achievement of compensatory students to those students not receiving compensatory instruction.

4. The cost effectiveness model utilized for the study needs to be further refined if it is to be practical for decision making at the local school district level. Additional cost factors should be included for situations where it cannot be assumed that the costs are equal for each of the groups studied.

5. More research needs to be done to determine the educational practicality of comparing cost effectiveness indices by the relative size of the index. The assumption that low ratios indicate gains are being purchased more efficiently than gains associated with higher ratios may not be valid.

APPENDIX A
SAMPLE DATA COLLECTION

STUDENT ID	TEACHER ID	GRADE	TREAT- MENT	SEX	RACE	SES	IQ	PRETEST				POSTTEST			
								VOC NCE	COMP NCE	TOTAL READING	VOC NCE	COMP NCE	TOTAL READING		
1		1	1	2	2	3		19	54	31					
2		1	1	1	2	1		30	47	31					
3	3	1	1	1	1	1	96	30	73	45	37	5	8		
4	1	1	1	1	1	1	96	68	22	45	37	35	38		
5	2	1	1	2	2	1	75	20	73	50	46	35	33		
6		1	1	2	2	3									
7	3	1	1	1	1	1	97	62	73	56	31	30	28		
8	1	1	1	1	2	2	105	68	67	65	42	30	43		
9	2	1	1	1	2	1	94	40	40	27	12	12	8		
10	1	1	1	2	1	1	97	40	40	27	37	35	31		
11		1	1	1	2	3									
12	2	1	1	1	1	1	91	62	47	50	37	12	21		

APPENDIX A - continued

STUDENT ID	TEACHER ID	GRADE	TREAT- MENT	SEX	RACE	SES	IQ	PRETEST				POSTTEST			
								VOC NCE	COMP NCE	TOTAL READING	VOC NCE	COMP NCE	TOTAL READING		
13		1	1	1	1	1									
14	6	2	1	1	1	1	102	33	39	31	43	41	40		
15	4	2	1	1	1	1	90	33	39	28	23	30	18		
16		2	1	2	2	2		40	25	27					
17	4	2	1	1	2	3	112	33	25	36	27	26	22		
18	6	2	1	2	2	1	100	47	52	47	51	63	46		
19	6	2	1	2	2	3	106	44	19	32	43	36	38		
20	5	2	1	2	1	1	109	40	25	31	30	36	23		
21	6	2	1	1	2	3	100	29	30	28	30	30	30		
22	5	2	1	1	2	1	100	53	47	49	51	41	38		
23	5	2	1	2	1	1	95	47	25	42	33	44	38		
24	6	2	1	1	2	1	95	40	8	34	30	9	16		
25	4	2	1	1	2	1	89	6	1	9	23	1	13		
26	5	2	1	2	2		113	47	19	34	36	33	32		

APPENDIX A - continued

STUDENT ID	TEACHER ID	GRADE	TREAT- MENT	SEX	RACE	SES	IQ	PRETEST				POSTTEST			
								VOC NCE	COMP NCE	READING NCE	TOTAL NCE	VOC NCE	COMP NCE	READING NCE	TOTAL NCE
27	6	2	1	1	1	1	90	33	19	31	36	30	32	32	32
28	8	3	1	2	2	1	103	23	37	28	18	24	13		13
29		3	1	2	2	2		33	45	33					
30	8	3	1	1	1	1	98	46	47	47	56	59	44		44
31	9	3	1	1	1	1	88	18	35	28	18	21	17		17
32	8	3	1	2	2	1	93	33	35	30	37	41	31		31
33	9	3	1	2	1	1	101	38	35	32	37	41	34		34
34		3	1	1	1	1									
35	8	3	1	2	1	1	79	38	25	27	44	49	31		31
36	8	3	1	1	2	3	106	23	29	23	34	33	30		30
37	10	3	1	1	2	3	67	18	4	6	34	18	30		30
38	10	4	1	2	2	1	79	20	25	17	42	37	22		22
39	10	4	1	1	2	1	85	16	21	9	15	18	8		8
40	10	4	1	1	2	2	120	20	32	18	31	33	20		20

APPENDIX A - continued

STUDENT ID	TEACHER ID	GRADE	TREAT- MENT	SEX	RACE	SES	IQ	PRETEST			POSTTEST		
								VOC NCE	COMP NCE	TOTAL READING	VOC NCE	COMP NCE	TOTAL READING
41	9	4	1	2	1	1	73	20	29	21	25	18	18
42	8	4	1	1	1	1	87	23	6	10	31	18	15
43	9	4	1	2	2	1	75	18	21	10	12	30	13
44	10	4	1	1	2	3	86	25	23	17	31	37	20
45		4	1	1	2	3							
46	10	4	1	2	2	3	102	49	43	31	42	52	34
47	10	4	1	2	2	1	92	29	25	34	42	37	38
48	11	4	1	2	2	1	91	49	38	35	42	52	43
49	10	4	1	1	1	1	79	7	1	9	12	28	15
50	10	4	1	1	1	1	74	16	23	18	15	13	15
51	8	4	1	2	2	2		20	18	19	42	30	25
52		5	1	1	2	3		58	47	41			
53	12	5	1	2	1	1	98	30	33	28	32	42	27
54	12	5	1	1	2	1	90	30	26	31	40	29	28

APPENDIX A - continued

STUDENT ID	TEACHER ID	GRADE	TREAT- MENT	SEX	RACE	SES	IQ	PRETEST			POSTTEST		
								VOC NCE	COMP NCE	TOTAL READING	VOC NCE	COMP NCE	TOTAL READING
55	13	5	1	1	2	1	77	22	22	19	14	15	12
56	13	5	1	2	2	2	86	35	55	34	40	49	36
57		5	1	2	2	3		35	28	34			
58	13	5	1	1	2	1	87	26	18	18	40	20	27
59	13	5	1	1	2	2	101	44	47	34	40	49	41
60	13	5	1	1	2	2	102	30	28	25	32	37	30
61	13	5	1	1	2	1	90	7	14	4	4	1	1
62	12	5	1	1	2	2	95	44	30	24	51	24	33
63	12	5	1	1	1	3	111	30	22	22	27	26	26
64	2	1	2	2	2	1	94	55	54	48	42	24	15
65		1	2	2	2	3							
66		1	2	1	1	3							
67	3	1	2	1	1	1	105	30			31	1	15
68		1	2	1	1	1	116	60	79	58			

APPENDIX A - continued

STUDENT ID	TEACHER ID	GRADE	TREAT- MENT	SEX	RACE	SES	IQ	PRETEST				POSTTEST			
								VOC NCE	COMP NCE	TOTAL READING	VOC NCE	COMP NCE	TOTAL READING		
69	3	1	2	2	1	1	93	40	54	38	42	30	35		
70	3	1	2	1	2	3	112	48	52	13	26	5	4		
71	1	1	2	1	1	1	100	62	47	45	59	52	44		
72	2	1	2	1	2	1	110	30	67	50	63	41	50		
73	2	1	2	1	1	1	102	30	60	38	42	24	30		
74	3	1	2	2	2	1	94	30	22	27	37	12	33		
75	3	1	2	2	1	1	87	30	40	27	42	30	23		
76	2	1	2	2	1	1	101	62	47	41	42	24	25		
77	2	1	2	1	2	3	114	40	12	18	31	30	23		
78	1	1	2	2	2	1	105	19	32	13	37	30	28		
79	1	1	2	1	2	3	79	40	47	38	3	41	18		
80	2	1	2	2	1	3	87	48	22	27	31	24	23		
81		2	2	1	2	3		29	8	27					
82	6	2	2	1	2	2	98	37	35	39	30	9	23		

APPENDIX A - continued

STUDENT ID	TEACHER ID	GRADE	TREAT- MENT	SEX	RACE	SES	IQ	PRETEST				POSTTEST			
								VOC NCE	COMP NCE	TOTAL READING	VOC NCE	COMP NCE	TOTAL READING		
83	4	2	2	1	2	3	128	40	43	37	27	36	29		
84	5	2	2	1	1	1	105	40	35	34	33	21	31		
85	5	2	2	2	2	1	107	23	35	27	27	41	30		
86	4	2	2	1	2	1	96	29	19	23	36	26	35		
87	6	2	2	1	2	3	95	29	19	23	30	33	30		
88	5	2	2	1	1	1	84	29	43	27	20	4	7		
89	4	2	2	2	1	1	82	29	39	27	33	30	20		
90	4	2	2	1	2	1	101	18	35	23	27	15	25		
91	6	2	2	1	2	1	119	33	25	23	36	36	31		
92	6	2	2	1	1	2	105	44	30	39	33	51	37		
93	6	2	2	2	1	1	97	40	30	39	43	56	42		
94	4	2	2	1	2	2	112	37	47	35	36	30	33		
95	6	2	2	2	2	1	107	44	13	25	33	30	31		
96	4	2	2	1	2	1	118	23	1	17	20	15	20		

APPENDIX A - continued

STUDENT ID	TEACHER ID	GRADE	TREAT- MENT	SEX	RACE	SES	IQ	PRETEST				POSTTEST			
								VOC NCE	COMP NCE	TOTAL READING	VOC NCE	COMP NCE	TOTAL READING		
97	5	2	2	2	1	1	89	29	13	12	36	36	34		
98	5	2	2	1	2	1	105	33	47	40	27	36	33		
99	6	2	2	2	2	3	69	23	8	25	27	9	26		
100	5	2	2	2	1	1	92	37	35	40	33	21	23		
101	4	2	2	2	2	1	80	29	19	15	23	9	5		
102	4	2	2	1	1	1	90	33	13	11	30	39	22		
103	4	2	2	1	2	1	124	33	35	37	43	47	38		
104	8	3	2	1	2	2	88	12	20	4	22	13	18		
105	8	3	2	1	2	1	88	1	4	11	1	18	13		
106	8	3	2	2	1	1	87	23	43	32	25	34	28		
107	9	3	2	1	1	1	91	18	20	24	37	65	35		
108	8	3	2	1	1	2	93	38	37	27	56	36	34		
109	8	3	2	1	1	1	113	40	32	29	56	65	51		
110	8	3	2	1	1	1	92	30	35	29	34	33	29		

APPENDIX A - continued

STUDENT ID	TEACHER ID	GRADE	TREAT- MENT	SEX	RACE	SES	IQ	PRETEST				POSTTEST			
								VOC NCE	COMP NCE	READING	TOTAL	VOC NCE	COMP NCE	READING	TOTAL
111	9	3	2	1	2	1	93	30	41	32	32	29	38	36	26
112	9	3	2	2	1	1	73	36	29	31	31	37	36	36	33
113	9	3	2	1	2	1	97	18	4	24	24	9	18	18	18
114	8	3	2	2	2	1	65	36	29	21	21	14	13	17	17
115	9	3	2	1	2	2	83	27	29	16	16	22	23	23	24
116	8	3	2	2	2	1	85	23	13	6	6	37	55	33	33
117	8	3	2	1	2	3	102	1	25	4	4	14	34	22	22
118	10	4	2	1	2	2	92	29	23	23	23	42	52	50	50
119	11	4	2	2	2	3	101	49	38	34	34	42	52	55	55
120	10	4	2	1	2	1	84	11	11	3	3	21	30	18	18
121	10	4	2	2	2	1	81	36	43	31	31	31	43	35	35
122	10	4	2	1	1	1	90	20	11	18	18	42	33	35	35
123	9	4	2	2	1	3	92	18	35	19	19	31	52	32	32
124	11	4	2	1	1	1	82	23	37	21	21	31	52	34	34

APPENDIX A - continued

STUDENT ID	TEACHER ID	GRADE	TREAT- MENT	SEX	RACE	SES	IQ	PRETEST			POSTTEST		
								VOC NCE	COMP NCE	TOTAL READING	VOC NCE	COMP NCE	TOTAL READING
125	10	4	2	2	1	1	86	23	31	20	42	33	34
126		4	2	2	2	2	87	20	23	17	42	43	47
127	10	4	2	2	2	3	107	36	50	31	42	37	25
128	8	4	2	1	2	1	77	11	15	2	19	16	11
129		4	2	2	2	3		29	38	22			
130	11	4	2	1	2	2	101	29	50	31	42	52	43
131	10	4	2	1	2	3	111	23	32	22	25	23	19
132	10	4	2	2	2	1	86	7	32	16	21	43	28
133	10	4	2	2	2	1	111	49	31	27	42	43	35
134	10	4	2	1	2	1	92	49	31	23	42	43	38
135	10	4	2	1	1	1	86	36	21	23			
136		4	2	2	2	3							
137	14	5	2	2	2	3	102	58	64	78	51	49	47
138	14	5	2	1	2	1	100	35	33	33	51	42	47

APPENDIX A - continued

STUDENT ID	TEACHER ID	GRADE	TREAT- MENT	SEX	RACE	SES	IQ	PRETEST			POSTTEST		
								VOC NCE	COMP NCE	TOTAL READING	VOC NCE	COMP NCE	TOTAL READING
139	13	5	2	2	1	1	80	12	23	16	23	24	20
140	12	5	2	1	2	3	102	19	37	25	20	19	15
141	13	5	2	1	1	3	100	12	26	18	32	32	28
142	13	5	2	1	2	1	96	12	14	14	23	10	14
143	12	5	2	1	1	2	96	44	23	33	32	37	36
144	13	5	2	1	1	3	80	16	37	21	20	37	25
145	12	5	2	1	2	2	97	44	47	37	51	37	36
146		5	2	1	2	3							
147	13	5	2	1	1	1	84	1	16	4	11	7	3
148	13	5	2	2	1	1	77	16	24	9	17	12	9
149	13	5	2	1	2	1	96	16	12	10	14	7	8
150	13	5	2	2	1	3	75	22	30	31	17	26	19
151	14	5	2	2	2	3	96	26	37	26	32	37	32
152	14	5	2	1	1	1	100	35	30	25	32	37	28

APPENDIX A - continued

STUDENT ID	TEACHER ID	GRADE	TREAT- MENT	SEX	RACE	SES	IQ	PRETEST			POSTTEST		
								VOC NCE	COMP NCE	TOTAL READING	VOC NCE	COMP NCE	TOTAL READING
153		5	2	1	1	1							
154	13	5	2	1	2	2	83	1	22	7	4	2	4
155	12	5	2	1	1	2	96	26	30	30	51	42	47

APPENDIX B
MODELS ENTERED IN THE REGRESSION ANALYSIS

Dependent Variables

Independent Variables

Vocabulary subtest =

reading teacher, grade, sex, race, socioeconomic status, ability,
vocabulary pretest, delivery mode, socioeconomic status by de-
livery mode, sex by delivery mode, race by delivery mode, and
grade by delivery mode

Comprehension subtest =

reading teacher, grade, sex, race, socioeconomic status, ability,
comprehension pretest, delivery mode, socioeconomic status by
delivery mode, sex by delivery mode, race by delivery mode, and
grade by delivery mode

Total Reading =

reading teacher, grade, sex, race, socioeconomic status, ability,
total reading pretest, delivery mode, socioeconomic status by
delivery mode, sex by delivery mode, race by delivery mode, and
grade by delivery mode

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BIOGRAPHICAL SKETCH

Patricia G. Chavous was born in Tampa, Florida, on March 17, 1930. She attended the public schools of Hillsborough County, graduating from Hillsborough High School in 1947. She received a BS degree from Florida State University in 1951 and a MS degree in 1957.

Between 1953 and 1961, Patricia taught elementary and secondary school in Baker County, Pasco County, and Sumter County. She served as the district social worker from 1960 through 1967 in Sumter County and as the Director of Student Services from 1967 through 1976. She has served as the ESEA Title I program supervisor in Sumter County since January 1977. The ESEA Title I Migrant program was included as part of her responsibilities beginning in September 1978.

Patricia is married to Donald Chavous. She is the mother of Don, Shirley, Alan, Terri, and Brian.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Education.



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Associate Professor of Educational
Administration and Supervision

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Education.



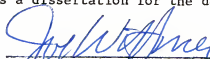
Ralph Bradley Kimbrough
Professor of Educational
Administration and Supervision

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Education.



Robert Stephen Soar
Professor of Foundations of Education

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Education.



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This dissertation was submitted to the Graduate Faculty of the Department of Educational Administration and Supervision in the College of Education and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Education.

June, 1980

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